might be given annually, provided the use made of the money was satisfactory and it proved convenient for the donor to spare it. We may assume that these conditions have been fulfilled, for from that day to this, or for eighteen successive years, this generous gift has been received. It has come to us quietly, promptly and without solicitation during all this time.

It has been administered in the same quiet way, and not one penny has been used for anything except to aid in research, or the publication of its results.

The influence of this gift has been as gentle and persuasive as the spring sunshine or summer shower. Nearly a score of special papers have been prepared and published by the academy through its aid. As many more have been published elsewhere. All honor to this scholarly, efficient, large-hearted, high-spirited man. I trust he believes that "the reward of a good deed is to have done it," if not, I don't know how he is to be paid.

We are here to-day in a spirit of congratulation. We congratulate our academy upon what it has accomplished. We congratulate Emerson McMillin on what he has done for the academy.

We congratulate the universities, colleges and high schools of Ohio that so large a number of their instructional force are active workers in our academy. Our annual meetings have confirmed and strengthened a spirit of good will between the educational institutions of the state. They have cultivated the amenities, and developed a feeling of brotherhood among our members. Our academy since its inception has stood for good scholarship, good fellowship and good citizenship. The essentials of a great landscape are unity and variety. These are likewise the great attributes of an association for the promotion of science. Unity in the spirit and ideals of the work to be accomplished, and variety, infinite variety, in the means by which these ideals may be developed. We come together on the basis of commanding interests and diverse experiences. This devotion to the varied phases of science detracts nothing from the pursuit of the older humanities, but adds materially to the effectiveness of any study that puts the student in closer touch with his environment—in closer touch with nature—and nature's law. This spirit was in Orton and Kellicott and Claypole, who were among the founders of the academy. What a fine influence these men exerted! What fine lives they led! It was a happy blending of the strenuous, the simple and the abundant life.

Strenuous, because in addition to the enforced and exacting labors of a teacher were added the self-imposed tasks of the investigator; simple, because they lived close to nature and her laws were the rule and guide of their daily conduct. They had neither time nor means for luxury. And most of all their lives were abundant; abundant in opportunity, abundant in accomplishment, abundant in honors, abundant in friendship. Demanding little, they received much. They are of those who, losing their lives, save them.

We are together to celebrate an epoch, not alone in the promotion of science, but in the attainment of the ideals of education; ideals for which the academy will stand in the future as in the past.

WILLIAM R. LAZENBY
OHIO STATE UNIVERSITY

THE NAVAL CONSULTING BOARD OF THE UNITED STATES[1]

THE so-called "five-million laboratory," proposed by the Naval Consulting Board,

[1] From an address made before the joint meeting of the New York Section of the American Chemical, the American Electrochemical Society, and the Society of Chemical Industry, by Dr. L. H.

has been the favorite subject of varied and picturesque criticisms which, as usual, originated more through lack of information than by ill-will.

Secretary Daniels requested each member to address to him his personal opinion on the advisability of the creation of a research laboratory where urgent technical matters relating to the needs of our navy could be studied successfully.

At the second meeting a special committee was appointed to submit a joint report. On this committee were, besides Mr. Edison, four other members. One of the other members of the committee is a man who has earned a national reputation in organizing and developing one of our largest mechanical industries. The second member is at the head of perhaps the largest and best endowed scientific research institution of the world; another is the chief of one of the most successful chemical and physical industrial research laboratories of this country; the fifth has devoted much of his life to private chemical research.

It was interesting to follow how the five members grouped themselves in accordance with their own point of view, dictated by their daily scope of action: The chemical or purely scientific members of this committee agreed pretty well on the kind of research laboratory they had in view, and although their suggestions had been written independently without consulting each other, their general recommendations as to the organization, equipment, and needed expenditures were fairly similar and relatively modest.

But their recommendations were mainly limited to a chemical and physical laboratory; they did not include the study of elaborate mechanical and technical problems which go far beyond the questions which are usually dealt with in chemical and physical research laboratories.

The two other members, on the contrary, wanted to prepare thoroughly for engineering problems of immediate importance, the solution of which seems indispensable if the money of the navy is to be spent to best advantage.

They set forth, from their own direct experience, how very expensive such engineering experimental work is likely to be.

Edison, for instance, pointed out the millions he spent in developing some of the details of his inventions; another member identified with the automobile industry stated that one single automobile concern here in the United States had found it necessary to spend half a million dollars in one year for experiments and research.

The modest estimate for a merely chemical and physical laboratory was thus snowed under by the irrefutable evidence of the much larger needs for a suitable mechanical or engineering department.

Of course, it was argued that the Navy possesses already several experimental stations at its different navy yards, and at the torpedo station in Newport, aside from the different testing laboratories for the materials used for ordnance or ammunition; that, furthermore, the excellent laboratory facilities of the Bureau of Standards are available.

The answer to this was that each and every one of the present institutions were more necessary than ever, but were totally insufficient; furthermore, the full cooperation of all of them is needed; all this in view of the fact that, at present, the navy of this country is facing unusual responsibilities.

If it is deemed urgent to be prepared for defense then this defense involves problems the solution of which can not be deferred

Baekeland, member of the board, and printed in *Metallurgical and Chemical Engineering.*

indefinitely. If something has to be done, it must be done immediately—not in five or ten years hence, when it may be too late.

In all of our present scientific research laboratories, time seems of relatively little or no account; problems which can not be solved to-day can be solved to-morrow or in ten years or during the next generations; but this is not the case with the problems connected with the contemplated defense of our country; the solution of these problems can not be postponed. They demand immediate action.

Nor is the condition of our navy similar to that of an industrial concern that can afford to take chances with machinery or equipment which is not strictly up to date, and still show some commercial success. For instance, recent events have demonstrated that there is no use building the best and newest fortresses against an enemy who possesses guns strong enough to demolish everything in existence.

Nor is there any chance of success in using the very best artillery at anything like equal chances if your adversary can do his scouting and range-finding with aeroplanes provided with reliable engines, while your aeroplanes are equipped with motors which give out at unexpected moments.

In our clumsy war with weak Spain, we went into the field with black powder when all other nations, even Spain, were equipped with smokeless powder. Why? Because we had postponed too long studying the chemistry of the subject.

The fact is that if we require a navy at all, our navy can not afford to use anything but the very best and most efficient means of defense. Not to possess the very best might put us in the same absurd condition as the wooden navies of the world were in after our civil war had established the supremacy of the iron-clad vessel.

The contemplated outlay for the navy for the next five years, for new ships, aviation and reserve of munitions, amounts to about $500,000,000. These tremendous expenditures of money, in order to be of real value, ought to be made as efficient as possible. All doubtful and inferior devices must be eliminated by direct experiment, by research and tests, *before* it is too late to remedy them.

This requires accelerated action; in fact, Mr. Edison's personal opinion was that research and laboratory work in this instance "should go on night and day without intermission" instead of the usual easy-going short-day plan followed in laboratories.

If one single automobile concern in the United States finds it to its advantage to spend in one year half a million dollars on testing, research, or experimentation, how much more important is the business of the United States navy, where money not spent wisely is better not spent at all, because then at least we shall not have the illusion that we are equipped for defense, when we have merely lost our money on antiquated devices.

Without mentioning any spectacular problems of modern warfare, it might be stated that such a prosaic detail as the corrosion of condenser tubes of our war ships involves an annual damage of about $2,000,000. If $1,000,000 were spent on research on this problem alone, with the result of reducing the damage to one half the total outlay would be compensated in a few months' time, aside from the important fact that our fleet would be stronger because less of our ships would be unavailable for service.

It was brought out that there was little use in spending so many millions on flying machines as long as there was any doubt on the reliability of their engines, and until an absolutely well-tried and standardized

engine had been developed. To accomplish this experimental work in a period of a few years would cost some money; but to do this rapidly, within a few months, before order is given to build these flying machines, requires enormous outlays of money, alongside of the indispensable engineering talent.

Another member brought out the fact that even conservative industrial enterprises found it necessary and profitable to spend at least 2 to 5 per cent. of their sales on research and experiments. At this rate, the contemplated expenditure of $500,000,000 in five years would certainly warrant an expenditure of at least five million for research during that period.

Money for this purpose, wisely used, ought to do so much good to the navy as to increase its efficiency by the value of several battleships costing considerably more. Mr. Edison's arguments were particularly eloquent when he enumerated the enormous expenditures for research in his own laboratories.

In this discussion everybody seemed to be well in accord with the general idea that whatever expenditures were recommended, the contemplated work should be carried out under immediate supervision of the navy; that this work should not be started all at once—full blast—but should be extended gradually, as fast as circumstances demand it.

In view of all this, two policies were open for obtaining the necessary appropriations —the old time-honored trick of asking from congress first an appropriation of a few thousand dollars, knowing very well that this would be insufficient, then after awhile ask an additional appropriation and keep on nagging and asking at various intervals.

But the members of the advisory board thought it a more honest policy to state the facts as they saw them and to confront the secretary of the navy with the probable maximum expenses for research and experimentation, commensurate to the five years' naval building program now under contemplation. The five-million dollar budget for experimental work to be expended during those five years, or about one million a year, may strike the uninitiated as needlessly large, although it is only about what some industrial enterprises have found necessary to spend on their own experimental work.

But if the nation does not want to go to the expense of developing the latest and most efficient means for defense at the lowest cost by obtaining the necessary information through preliminary experiments, instead of committing mistakes on a large permanent scale; or if our country wants its navy to keep on building its ships or other means of defense, as were good enough in the past, regardless of the fact that modern war requires the very latest and the most efficient available devices, then let us not be astonished if after incomparably more money has been spent for increased armaments, we find that we are loaded with means of defense which have become obsolete in the meantime and are merely good for the junkheap of antiquated equipment.

The foregoing is a brief résumé of various arguments which were submitted by some members of the board, and this is the first time that this discussion has been reported in public. Let us hope that its publication may help to dispel some of the ideas of the public which imagines that the board contemplates the immediate erection of a "$5,000,000 laboratory building, where the members of the Naval Consulting Board can experiment to their hearts' content in company with long-haired inventors."

As Mr. Edison expressed it picturesquely:

"The money should be spent not on buildings, but on a national junkshop," where means of defense can be tried out first, at relatively small cost so as to learn how to get the most and very best for the money, and so as to avoid making expensive and dangerous blunders on a wholesale scale.

SCIENTIFIC NOTES AND NEWS

THE American Association for the Advancement of Science and the scientific societies affiliated with it meet at the Ohio State University, Columbus, Ohio, beginning on Monday, December 27. The program of the meeting has been printed in SCIENCE, and details in regard to the places of meeting and the officers of the different societies that meet during convocation week will be found elsewhere in the present issue of the journal.

WE have not been able to obtain any program of the Pan-American Scientific Congress which meets in Washington for two weeks beginning on December 27. It is possible that after the adjournment of the Columbus meeting of the American Association, the council will call a special meeting at Washington in conjunction with the congress.

THE nineteenth International Congress of Americanists and the affiliated societies, meeting in Washington from December 27 to 31, has an extensive program on which are represented most American anthropologists and a number of foreigners.

THE State Geographical Society of New Mexico was organized in October with David Ross Boyd, Ph.D., president of the state university as president, and Governor McDonald, Senator Catron, Ex-Governor Prince and Professor C. T. Kirk, as vice-presidents.

DR. ERASMUS KITTLER, known for his work in electro-technics, has been awarded an honorary doctorate of engineering by the Darmstadt Technical School.

DR. ALBERT STUTZER, professor of agricultural chemistry at Königsberg, will retire from active service at the close of the present semester.

DR. HUGO FISCHER has been appointed acting head of the chemical and bacteriological department of the Kaiser Wilhelm Department for Agriculture in Bromberg.

KING FERDINAND, of Bulgaria, has been removed from the membership in the Entomological Society of France, which he has held since 1882. His name has also been erased from the membership list of the Petrograd Entomological Society. In this society there has been elected in his place, M. Lameere, of Brussels, who is now working in the Paris Museum of Natural History.

THE Massachusetts Agricultural College at Amherst has sent Professor F. A. Waugh to lecture to the students in landscape gardening at the University of Illinois. In exchange, the Illinois Agricultural College has sent Professor R. R. Root to take charge of the classes of Professor Waugh at Amherst.

DR. CHARLES S. PALMER, formerly professor of chemistry in the University of Colorado, and later consulting chemical engineer for various manfacturing interests in New England, has recently accepted a fellowship in the Mellon Institute for Industrial Research of the University of Pittsburgh.

AT the last meeting of the Rumford Committee of the American Academy of Arts and Sciences, the following appropriations were made: $200 for the purchase of a comparator to be used by Mr. Raymond T. Birge, of Syracuse University, in his researches in spectroscopy. $400, in addition to a former appropriation, to Professor P. W. Bridgman, of Harvard University, in aid of his researches upon thermal phenomena under high pressures. $300, in addition to a former appropriation, to Professor A. L. Clark, of Queens University, in aid of his researches on the physical properties of vapors in the neighborhood of the critical point. $300, in addition to a previous appropriation, to Professor Gilbert N. Lewis, of the University of California, in aid of his researches on free energy.

PROFESSOR BENJAMIN MILLER, of Lehigh University, and Dr. Joseph T. Singewald, Jr., associate in economic geology at the Johns